

# **RIGOL**

## **Quick Guide**

### **DG2000 Series Function/Arbitrary Waveform Generator**

**Sept. 2010**  
**RIGOL Technologies, Inc.**



# Guaranty and Declaration

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## Product Certification

**RIGOL** guarantees this product conforms to the national and industrial standards in China. International standard conformance certification is in progress, e.g. ISO.

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If you have any problem or requirement when using our products, please contact **RIGOL** Technologies, Inc. or your local distributors, or visit: [www.rigol.com](http://www.rigol.com)

# Safety Notice

Please review the following safety precautions carefully before putting the instrument into operation so as to avoid any personal injuries or damages to the instrument and any product connected to it. To prevent potential hazards, please use the instrument only specified by this manual.

## **Use Proper Power Cord.**

Only the power cord designed for the instrument and authorized by local country could be used.

## **Ground The Instrument.**

The instrument is grounded through the Protective Earth lead of the power cord. To avoid electric shock, it is essential to connect the earth terminal of power cord to the Protective Earth terminal before any inputs or outputs.

## **Observe All Terminal Ratings.**

To avoid fire or shock hazard, observe all ratings and markers on the instrument and check your manual for more information about ratings before connecting.

## **Do Not Operate Without Covers.**

Do not operate the instrument with covers or panels removed.

## **Avoid Circuit or Wire Exposure.**

Do not touch exposed junctions and components when the unit is powered.

**Do Not Operate With Suspected Failures.**

If you suspect damage occurs to the instrument, have it inspected by qualified service personnel of **RIGOL** before further operations.

**Keep Well Ventilation.**

Inadequate ventilation may cause increasing of temperature or damages to the device. So please keep well ventilated and inspect the intake and fan regularly.

**Do Not Operate in Wet Conditions.**

In order to avoid short circuiting to the interior of the device or electric shock, please do not operate in a humid environment.

**Do Not Operate in an Explosive Atmosphere.**

In order to avoid damages to the device or personal injuries, it is important to operate the device away from an explosive atmosphere.

**Keep Product Surfaces Clean and Dry.**

To avoid the influence of dust and/or moisture in air, please keep the surface of device clean and dry.

# Safety Terms and Symbols

**Terms in this Manual.** These terms may appear in this manual:



## WARNING

Warning statements indicate the conditions or practices that could result in injury or loss of life.



## CAUTION

Caution statements indicate the conditions or practices that could result in damage to this product or other property.

**Terms on the Product.** These terms may appear on the product:

**DANGER** indicates an injury or hazard may immediately happen.

**WARNING** indicates an injury or hazard may be accessible potentially.

**CAUTION** indicates a potential damage to the instrument or other property might occur.

**Symbols on the Product.** These symbols may appear on the product:



Hazardous  
Voltage



Refer to  
Instructions



Protective  
Earth  
Terminal



Chassis  
Ground



Test  
Ground

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# Quick Start

## General Inspection

### 1. Inspect the shipping container for damage

Keep the damaged shipping container or cushioning material until the contents of the shipment have been checked for completeness and the instrument has passed both electrical and mechanical tests.

The consigner or carrier shall be liable for the damage to instrument resulting from shipment. **RIGOL** would not be responsible for free maintenance/rework or replacement of the unit.

### 2. Inspect the instrument

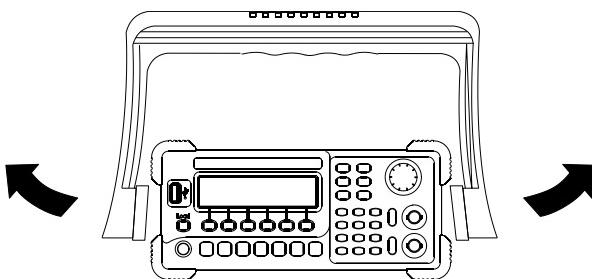
In case of any damage, or defect, or failure, notify your **RIGOL** sales representative.

### 3. Check the accessories

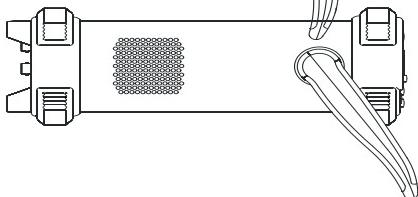
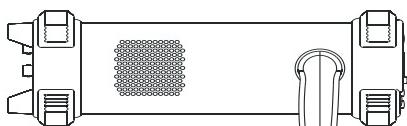
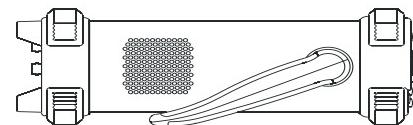
Please check the accessories according to the packing lists. If the accessories are incomplete or damaged, please contact your **RIGOL** sales representative.

## Handle Adjustment

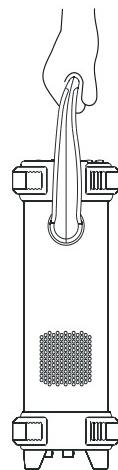
To adjust the handle position of DG2000 Function/ Arbitrary Waveform Generator, please grip the handle by the sides and pull it outward. Then, make the handle rotate to the desired position. The operating methods are shown below.



Adjusting the Handle



Viewing Positions



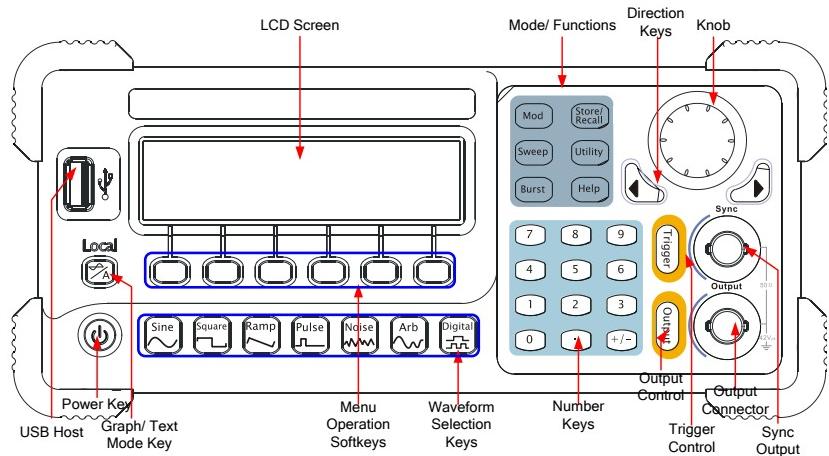
Carrying Position

# The Front/Rear Panel

This section will make a brief introduction and description for the operation and functions of the Front/ Rear Panel of DG2000 Series Function/ Arbitrary Waveform Generator.

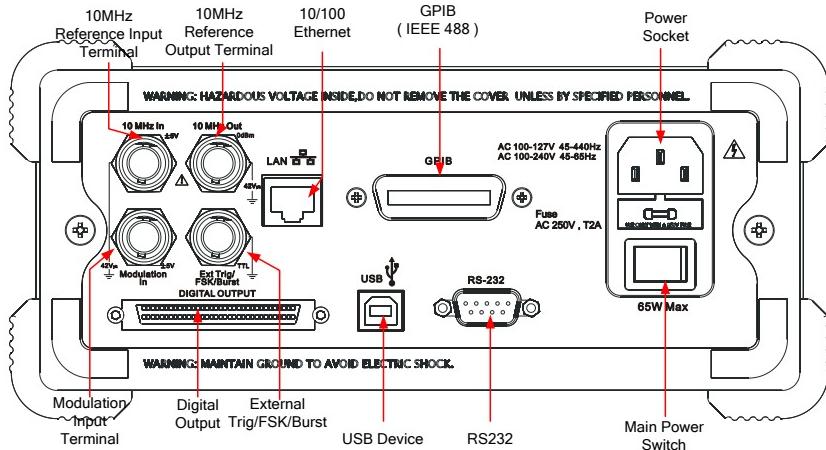
## Front Panel at a Glance

DG2000 has clear and simple front panel. The Front Panel has a knob, functional keys and menu softkeys. The 6 grey keys below the screen are menu softkeys, with the help of which, you can choose different options on the current menu. The rests are the functional keys, with which you can enter different function menus or obtain specific functional applications directly.



**CAUTION:** The **[Output]** and **[Sync]** connectors on the front panel can be only used for the signal output. If they are used for input, it may make the circuit burned and the instrument in trouble.

## Rear Panel at a Glance



### Signs for the panel keys in this manual:

The signs for the panel keys in this manual are the same as the panel keys. Please note that the signs for the functional keys on the operation panel are represented by squared words, such as **Sine**, which represents the transparent functional key with Sine on it on the front panel, while the menu softkeys are represented by shadow words such as **Frequency**, which means the "Frequency" option in the **Sine** menu.

# Device Connection

## Power Connection

Connect the power socket and AC supply with power cord attached to the instrument. Turn on the power switch at the rear panel to power on the generator, then press the power key on the front panel to start the instrument immediately.

If start abnormally, please check according to the following steps:

1. Check if the power cord is normally connected and the power switch on the rear panel has been turned on.
2. Check if the fuse is intact, or esle please replace it.
3. If the instrument still cannot be started, contact **RIGOL** for help.

## USB Connection

**USB Host:** This port is used to transfer data when external USB device connects to the generator regarded as a “Host” device. For example, connect a USB flash device for data storage.

**USB Device:** This port is used to transfer data when external USB device connects to the generator regarded as a “Slave” device. For example, connect with PC for remote control.

## BNC Connection

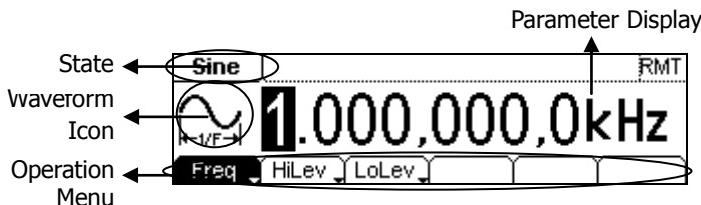
Interfaces need to be connected by BNC Cable include: [**Sync**], [**Output**] on the front panel and [**10MHz In**], [**10MHz Out**], [**Modulation In**], [**Ext Trig/FSK/Burst**] on the rear panel.  
Insert BNC cable to the connector vertically, and rotate clockwise to lock it.

# User Interface

DG2000 Series Function/ Arbitrary Waveform Generator provide two display modes: Menu and Graph. These two display modes can be switched to each other by pressing the  key.

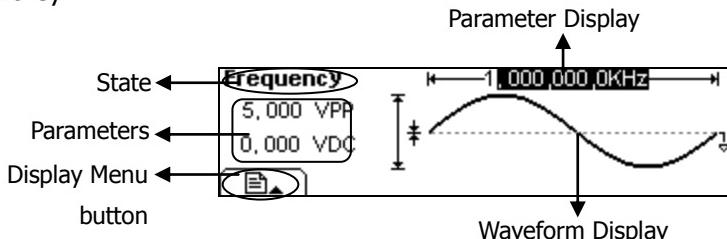
## Menu Display Mode

Under the Menu display mode, the display interface is divided into these parts: state, waveform icon, operation menu, and parameter display. See the figure below.



## Graph Display Mode

Under the Graph display mode, you can check the current waveform parameters in the graphics. The display interface is also divided into these parts: state, parameter display, display menu softkey and waveform display. See the figure below. The operation menu will appear at the bottom of the screen when you press any menu softkey.

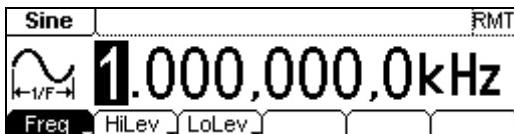


## To Set a Waveform

At the left of the operation panel, there is a set of keys with waveform icon. The exercise below will help you familiarized with the waveform selection settings. The instructions of the waveform setting are all carried out in the Menu Display Mode.

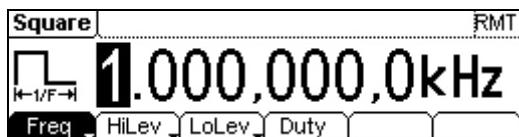


1. Press **Sine**, the waveform icon turns into Sine with a "Sine" typeface in the state area. DG2000 Series Generator can generate Sine signal with frequency from 1 $\mu$ Hz to 40MHz. By setting Frequency/Period, Amplitude/ High Level, Offset/ Low level, the Sine signal with different parameters can be generated.



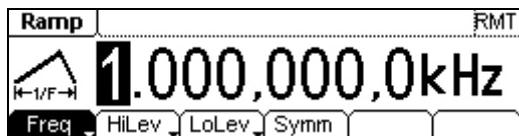
As shown in the figure above, the default signal parameters are: 1kHz Frequency, 5.0 V<sub>pp</sub> Amplitude and 0V<sub>dc</sub> Offset.

2. Press **Square**, the waveform icon turns into Square with a "Square" typeface in the state area. DG2000 Series Generator can generate Square signal with frequency from 1 $\mu$ Hz to 40MHz and variable duty cycle. By setting Frequency/Period, Amplitude/ High Level, Offset/ Low level, and Duty Cycle, the Square signal with different parameters can be generated.



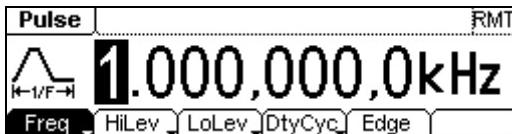
As shown in the figure above, the default signal parameters are: 1kHz Frequency, 5.0 V<sub>pp</sub> Amplitude, 0 V<sub>dc</sub> Offset and 50% Duty Cycle.

3. Press **Ramp**, the waveform icon turns into Ramp with a "Ramp" typeface in the state area. DG2000 Series Generator can generate Ramp signal with frequency from 1μHz to 400 kHz and variable Symmetry. By setting Frequency/Period, Amplitude/ High Level, Offset/ Low level, and Symmetry, the Ramp signal with different parameters can be generated.



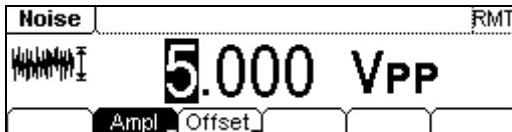
As shown in the figure above, the default signal parameters are: 1kHz Frequency, 5.0 V<sub>pp</sub> Amplitude, 0 V<sub>dc</sub> Offset and 50% Symmetry.

4. Press **Pulse**, the waveform icon turns into Pulse with a "Pulse" typeface in the state area. DG2000 Series Generator can generate Pulse signal with frequency from 500μHz to 16MHz and variable Pulse Width and Edge Time. By setting Frequency/Period, Amplitude/ High Level, Offset/ Low level, Pulse Width and Edge Time, the Pulse signal with different parameters can be generated.



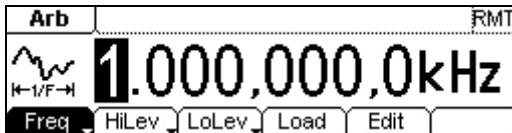
As shown in the figure above, the default signal parameters are:  
1kHz Frequency, 5.0 V<sub>pp</sub> Amplitude, 0 V<sub>dc</sub> Offset, 20% Duty Cycle and 50ns Edge Time.

5. Press **Noise**, the waveform icon turns into Noise with a "Noise" typeface in the state area. DG2000 Series Generator can generate Noise signal with Band Width up to 20MHz. By setting Amplitude/ High Level, Offset/ Low level, the Noise signal with different parameters can be generated.



As shown in the figure above, the default signal parameters are:  
5.0 V<sub>pp</sub> Amplitude and 0 V<sub>dc</sub> Offset.

6. Press **Arb**, the waveform icon turns into Arb with an "Arb" typeface in the state area. DG2000 Series Generator can generate repeatable arbitrary waveform signals with at most 512K points and 12MHz frequency. By setting Frequency/Period, Amplitude/ High Level, Offset/ Low level, arbitrary waveform signals with different parameters can be generated.



As shown in the figure above, the default Exponential Rise Signal parameters are: 1kHz Frequency, 5.0 V<sub>pp</sub> Amplitude and 0 V<sub>dc</sub> Offset.

7. **Digital** is a reserved function key for the Logic Signal Output Module.

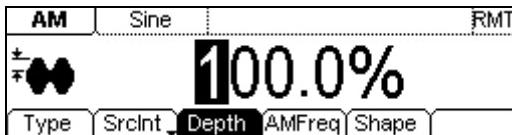
**Note: Description of the parameter range based on the DG2041A model in this section.**

## To Use the Mod/ Sweep/Burst Function

As shown in the figure below, there are three keys on the front panel, which are used for **Mod**, **Sweep** and **Burst** settings. The instructions below will help you familiarize with the setting of these functions.



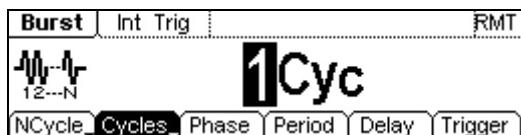
1. Press **Mod**, a modulated waveforms will be generated. DG2000 Series can generate AM, FM, PM, PWM and FSK modulate waveforms. Parameters are set by using the menu softkeys. The modulated waveform can be changed by changing the parameters such as Type, Internal/External Modulation, Depth, Frequency, Waveform, etc.



2. Press **Sweep**, Sine, Square, Ramp or Arbitrary waveform can be swept (Pulse, Noise and DC cannot be swept). In the Sweep Mode, DG2000 Series generate signal with variable frequencies.



3. Press **Burst**, Burst for Sine, Square, Ramp, Pulse or Arbitrary waveform can be generated (Noise can only be used in the gated Burst).



### Term Explanation

**Burst:** Output Waveforms with set cycle times

Burst can last for certain times of waveform cycle (N-Cycle Burst) or be controlled by external gated signals (Gated Burst). Burst applies to all kinds of waveforms, but noise can only be used in gated burst. Generally it is called BURST function within every Signal Generator.

## To Trigger/Output

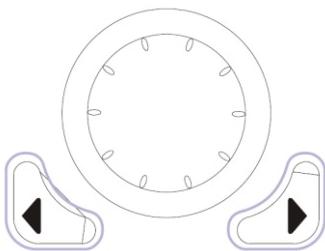
As shown in the figure below, there are two keys on the right side of the operation panel, which are used to set Trigger and Output Control. The instruction below will help you familiarize with these functions.



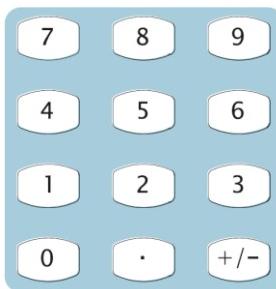
1. Press **Trigger**, choose internal/external or manual Trigger (Manual Trigger can only be used in Sweep and N-Cycle Burst)
  - The default setting for Trigger is "Internal". In this mode, when the Sweep or Burst Mode is also selected, the Generator will continuously generate sweep or burst waveform. At this time, press **Trigger**, the instrument will shift from the "Automatic" Trigger mode into "Manual" Trigger mode.
  - When the generator uses the "External" Trigger Mode, if the Sweep or the Burst Mode is selected, the signal will be continuously generated. At this time, press **Trigger**, the instrument state will not change, and it will show the information "The instrument has already been triggered".
  - Every time you press the **Trigger**, "Manual" Trigger will start a sweep or generate a burst. Press the key again, and the generator will be triggered again.
2. Press **Output**, activate or deactivate the output signal. If an overload message is shown, disconnect the external equipment from the **[Output]** terminal and press **Output**, reactivate the output terminal.

## To Use the Digital Input

As shown in the figure below, there are two groups of keys on the operation panel, which are the direction keys, the knob and the keyboard. The instruction below will help you familiarize with the Digital Input Function.



Direction Keys and the Knob



Keyboard

1. Use the Direction keys to move the cursor left or right. Rotate the knob to change a digit (clockwise to increase 1), and the range of digit is 0~9.
2. Use the Keypad to set the parameters values of the waveforms, which can change its value directly.

## To Use the Store/Utility/Help Function

As shown in the figure below, there are three keys on the operation panel, which are used to call the store/recall, utility and help function. The instruction below will help you familiarize with these Functions.



1. The **Store/Recall** key is used to store waveform data and configure information.
2. The **Utility** key is used to set the auxiliary system function, change the output configure parameters, interface setting, system setting information or perform the instrument self-test and read the calibration information, etc.
3. The **Help** key is used to see the help information.

### Get help on any key:

To get help on any key of the front panel, press the key and last for about 1 second, then the help message will appear.

# Troubleshooting

- 1. If the screen does not turn on even if the generator is on, please follow the steps below:**
  - (1) Check if the power is correctly connected.
  - (2) Check if the power switch is really on.
  - (3) Restart the instrument after taking the above steps.
  - (4) If it does not work correctly, contact **RIGOL** for our service.
- 2. If the settings are correct but no waveform is generated, please follow the steps below:**
  - (1) Check if the Signal Line is correctly connected to the **[Output]** terminal.
  - (2) Check the BNC if it works correctly.
  - (3) Check the **Output** key, if it is turned on.
  - (4) Press **Utility** → **System** → **Setting** → **PowOn** → **Latest** when all the above steps have been finished. Restart the computer.
- 3. The U-disk cannot be recognized:**
  - (1) Check if the U-disk can work normally.
  - (2) Make sure the U-disk is USB flash disk. The generator doesn't support hard drive-based U-disk.
  - (3) Restart the instrument, reinsert the USB device and check it.
  - (4) If the U-disk still does not work normally, please contact **RIGOL**.